

CLAIMS

1. A lithographic projection apparatus comprising:
  - a support structure configured to hold a patterning device, the patterning device configured to pattern a beam of radiation according to a desired pattern;
  - a substrate table configured to hold a substrate;
  - a projection system configured to project the patterned beam onto a target portion of the substrate;
  - a liquid supply system configured to provide an immersion liquid, through which said beam is to be projected, in a space between said projection system and said substrate; and
  - a shutter configured to keep said projection system in contact with liquid when said substrate is moved away from under said projection system.
2. An apparatus according to claim 1, wherein said shutter is positionable on a side of said supply system opposite said projection system such that liquid can be confined in said liquid supply system and between said projection system and said shutter.
3. An apparatus according to claim 2, wherein said shutter comprises a surface of said substrate table.
4. An apparatus according to claim 2, wherein said shutter is separable from the remainder of said apparatus.
5. An apparatus according to claim 4, wherein at least one of said shutter and said substrate table comprises a holding device configured to releasably hold said shutter to said substrate table.
6. An apparatus according to claim 4, comprising an attachment device configured to releasably attach said shutter to said liquid supply system.

7. An apparatus according to claim 5, wherein said holding device comprises a magnet.
8. An apparatus according to claim 6, wherein said attachment device comprises a magnet.
9. An apparatus according to claim 5, wherein said holding device comprises a vacuum outlet configured to attract said shutter to said substrate table.
10. An apparatus according to claim 6, wherein said attachment device comprises a vacuum outlet configured to attract said shutter to said liquid supply system.
11. An apparatus according to claim 10, wherein said liquid supply system comprises a liquid confinement structure which extends along at least part of the boundary of said space to contain said immersion liquid and which comprises a low pressure outlet configured to seal between said structure and said substrate, said low pressure outlet forming at least part of said attachment device.
12. An apparatus according to claim 2, wherein, in a stowed position, said shutter has a primary surface substantially co-planar with a surface of said substrate facing said final element.
13. An apparatus according to claim 3, wherein said shutter has a primary surface substantially co-planar with a surface of said substrate facing said final element and is closely adjacent to the edge of said substrate.
14. An apparatus according to claim 2, wherein said shutter comprises a guide mark.
15. An apparatus according to claim 14, comprising a sensor configured to measure a position of said shutter using said guide mark.

16. An apparatus according to claim 1, wherein the liquid supply system comprises a liquid confinement structure extending along at least a part of the boundary of said space between the final element and the substrate table and wherein said shutter, when keeping said final element in contact with liquid, is positioned in said structure.
17. An apparatus according to claim 1, wherein said liquid supply system comprises an outlet configured to remove liquid from said space and a gas inlet configured to provide flushing gas in said space.
18. An apparatus according to claim 2, wherein said lithographic apparatus comprises a controller configured to move at least one of the substrate table towards the liquid supply system and at least a portion of the liquid supply system towards the substrate table so that the shutter confines liquid in said liquid supply system.
19. An apparatus according to claim 2, wherein said shutter comprises a shape configured to center the shutter when being attached to the liquid supply system.
20. An apparatus according to claim 2, wherein said substrate table comprises a channel to remove liquid that leaks from between said projection system and the shutter.
21. An apparatus according to claim 1, wherein said liquid supply system comprises at least one inlet to supply said immersion liquid onto the substrate and at least one outlet to remove said immersion liquid after said liquid has passed under said final element.
22. An apparatus according to claim 1, wherein said liquid supply system is configured to provide said liquid to a space between a final lens of said projection system and said substrate.
23. A device manufacturing method comprising:
  - providing an immersion liquid to a space between a projection system and a substrate;
  - projecting a patterned beam of radiation, through said liquid, onto a target portion

of the substrate using the projection system; and

maintaining said projection system in contact with liquid after said substrate has been moved away from under said projection system.

24. A method according to claim 23, wherein maintaining said projection system in contact with liquid comprises positioning a shutter on a side opposite said projection system such that liquid is confined between said projection system and said shutter.

25. A method according to claim 24, wherein said shutter comprises a surface of a substrate table.

26. A method according to claim 24, wherein said shutter is separable from the remainder of a lithographic apparatus.

27. A method according to claim 26, comprising releasably holding said shutter on a substrate table.

28. A method according to claim 26, comprising releasably attaching said shutter to a liquid supply system used to provide said immersion liquid to said space.

29. A method according to claim 27, wherein releasably holding comprises holding said shutter using at least one of magnetic force and vacuum.

30. A method according to claim 28, wherein releasably attaching comprises attaching said shutter using at least one of magnetic force and vacuum.

31. A method according to claim 24, comprising measuring a position of said shutter using a guide mark.

32. A method according to claim 24, wherein said shutter, when keeping said projection system in contact with liquid, is positioned in a structure of a liquid supply system used to provide said immersion liquid to said space.

33. A method according to claim 23, comprising removing liquid from said space and flushing said space with a gas.
34. A method according to claim 24, comprising moving at least one of a substrate table towards a liquid supply system used provide said liquid and at least a portion of said liquid supply system towards said substrate table so that the shutter confines liquid in said liquid supply system.
35. A method according to claim 24, comprising removing liquid that leaks from between said projection system and the shutter.
36. A method according to claim 23, wherein providing said immersion liquid comprises supplying said immersion liquid onto the substrate through at least one inlet and removing said immersion liquid, after said liquid has passed under said projection system, through at least one outlet.
37. A method according to claim 23, comprising providing said liquid to a space between a final lens of said projection system and said substrate.